

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (Currently Amended) A method of operating a multistage modulating boiler system, the multi-stage modulating boiler system including two or more stages of modulating boilers, the multi-stage modulating boiler system adapted to provide heat to maintain a first setpoint for a circulating fluid heated by the multi-stage modulating boiler system and to maintain a first temperature setpoint, the method comprising:

receiving an indication a signal indicating that a stage of the multi-stage modulating boiler system should be activated and whether the stage is currently a first stage of the multi-stage modulating boiler to be activated;

receiving a normal firing rate for the stage, the normal firing rate is based on an error signal that is related to a deviation between the first temperature set point and a temperature of the circulating fluid in the multi-stage modulating boiler system;

activating the stage at the normal firing rate if the stage is not the first stage of the multi-stage boiler to be activated;

activating the stage at a first firing rate if the stage is the first stage of the multi-stage boiler to be activated, wherein the first firing rate is less than the normal firing rate; and

maintaining the first firing rate for a period of time unless a predefined condition that is related to a system temperature occurs during the period of time; and

activating the stage at the normal firing rate after the period of time expires.

2. (Currently Amended) The method of claim 1 wherein the predefined condition includes when the temperature of [[a]] the circulating fluid in the multi-stage modulating boiler system drops below a predetermined level.

3. (Currently Amended) The method of claim 1 wherein the predefined condition includes when a rate of change for a sensed temperature for [[a]] the circulating fluid in the multi-stage modulating boiler system rises above a predetermined level.

4. (Currently Amended) The method of claim 1 wherein:
the multi-stage modulating boiler system includes a modulating boiler stage for heating [[a]] the circulating fluid, the modulating boiler stage having a primary heat exchanger and a bypass temperature sensor for sensing a bypass temperature of the circulating fluid entering the primary heat exchanger; and

the predefined condition includes a likelihood of condensation within the primary heat exchanger of the modulating boiler stage.

5. (Original) The method of claim 4 wherein the likelihood of condensation is predicted based upon sensing of the bypass temperature.

6. (Currently Amended) The method of claim 4 wherein:
the modulating boiler stage system includes a secondary heat exchanger associated with the primary heat exchanger and an inlet temperature sensor for sensing an inlet temperature of the circulating fluid entering the secondary heat exchanger; and
the likelihood of condensation is predicted based upon sensing of the inlet temperature.

7. (Currently Amended) The method of claim 1 wherein the first firing rate is set independent of the normal firing rate ~~a sensed temperature deviation from the setpoint~~.

8. (Currently Amended) A controller for a multi-stage modulating boiler system having one or more modulating boiler stages, the controller configured to perform the steps of:
receiving an indication ~~a signal indicating~~ that a stage of the multi-stage modulating boiler system should be activated and whether the stage is currently a first stage of the multi-stage modulating boiler to be activated;

receiving a normal firing rate for the stage, the normal firing rate is based, at least in part, on a heat load on the multi-stage modulating boiler system;

activating the stage at a first firing rate if the stage is the first stage of the multi-stage modulating boiler to be activated, wherein the first firing rate is less than the normal firing rate;
and

maintaining the first firing rate for a period of time unless a predefined condition that is related to a system temperature occurs during the period of time.

9. (Currently Amended) A controller as in claim 8 wherein:

the multi-stage modulating boiler system includes a boiler stage for heating a circulating fluid, the boiler stage having a primary heat exchanger and a bypass temperature sensor for sensing a bypass temperature of the circulating fluid entering the primary heat exchanger; and
the predefined condition includes a likelihood of condensation within the primary heat exchanger.

10. (Currently Amended) A controller as in claim 9 wherein:

the multi-stage modulating boiler system includes a secondary heat exchanger associated with the primary heat exchanger and an inlet temperature sensor for sensing an inlet temperature of the circulating fluid entering the secondary heat exchanger; and
the likelihood of condensation is predicted based upon sensing of the inlet temperature.

11. (Currently Amended) A method of controlling stages in a multi-stage modulating boiler system, the method comprising:

receiving an indication that a stage of the multi-stage modulating boiler system that is not active is to become active;

determining whether the stage is the first stage to become active; and

if the stage is the first stage to become active, activating the stage at a first firing rate and maintaining the first firing rate for a period of time unless a predefined condition that is related to a system temperature occurs during the period of time; and

activating the stage at second firing rate if the stage is not the first stage to become active.

12. (Currently Amended) A controller for controlling a stage in a multi-stage modulating boiler system, the controller configured to perform the steps of:
- receiving an indication that a stage of the multi-stage modulating boiler system that is not active is to become active;
 - determining whether the stage is the first stage to become active; ~~and~~
 - if the stage is the first stage to become active, activating the stage at a first firing rate and maintaining the first firing rate for a period of time unless a predefined condition that is related to a system temperature occurs during the period of time; and
 - activating the stage at second firing rate that is higher than the first firing rate if the stage is not the first stage to become active.

13. (Currently Amended) A method of controlling a multi-stage modulating boiler system, the multi-stage modulating boiler system adapted to meet a heat load, the method comprising:
- determining whether to activate a stage of the multi-stage modulating boiler system when no stages are active; and, if so:
 - activating a stage; and
 - controlling the stage with a stable firing rate independent of heat load for a period of time unless one or more of a number of conditions is satisfied during the period of time, wherein one of the predefined conditions is related to a system temperature and another one of the conditions include whether the stage is no longer needed.

14. (Original) The method of claim 13 wherein the conditions also include whether it is determined that the stage cannot operate without potential damage at the stable firing rate.

15. (Canceled)

16. (Currently Amended) A controller for controlling a multi-stage modulating boiler system, the controller configured to perform the steps of:

determining whether to activate a stage of the multi-stage modulating boiler system when no stages are currently active; and, if so:

activating a stage; and

controlling the stage with a stable firing rate independent of heat load for a period of time unless at least one of a number of conditions is satisfied during the period of time, wherein the conditions include:

whether the stage is no longer needed.

17. (Currently Amended) A system controller for a multi-stage modulating boiler system, the system controller having at least a first configuration and a second configuration, wherein:

the first configuration of the system controller enables the system controller to perform the steps of:

determining that a stage of the multi-stage modulating boiler system that is inactive should become active;

signaling the stage to become active; and

indicating to the stage whether or not it is the first stage to become active; and

the second configuration of the system controller enables the system controller to perform the steps of:

determining that a stage of the multi-stage modulating boiler system that is inactive should become active;

signaling the stage to become active;

determining whether the stage is the first stage to become active and, if so, providing a heat demand signal to the stage at a level selected to keep the first stage at a relatively low output level for a period of time unless one of a number of conditions is met during the period of time.

18. (Previously Presented) The system controller of claim 17 wherein the number of conditions include:
whether the stage is no longer needed.

19. (Currently Amended) A stage controller for controlling a stage of a multi-stage modulating boiler system, the stage controller communicating with a boiler system controller, the stage controller performing the steps of:

in response to the system controller signaling that the stage is to become active, activating the stage;

in response to the system controller indicating that the stage is the first stage to become active, activating the stage at a first firing rate and maintaining the first firing rate for a period of time unless a predefined condition occurs during the period of time.

20. (Original) The stage controller of claim 19 wherein, for the stage controller, a predefined condition includes a determination that condensation in a heat exchanger of the stage may be likely.

21. (Currently Amended) A method of operating a multi-stage modulating boiler system, the multi-stage modulating boiler system adapted to provide heat to maintain a first setpoint for a fluid heated by the multi-stage modulating boiler system, the method comprising:

receiving a signal indicating that a stage of the multi-stage modulating boiler system should be activated;

activating the stage at a first firing rate; and

maintaining the first firing rate unless one or more predefined conditions occur, wherein one or more of the predefined conditions is related to a system temperature.

22. (Previously Presented) A method as in claim 21 wherein one of the predefined conditions relates to one or more sensed temperature(s) of the fluid.